

Black Opal Xtreme Air 8 Airborne Special Flat Panel Display System

XTREME
AIR 8



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Black Opal Xtreme Air 8 Airborne Special Flat Panel Display System

1 DESCRIPTION

Laserdyne's Black Opal displays have been engineered for a wide range of land-, sea- or air-borne display applications including remote/indirect viewing of video images generated by day, night or thermal cameras.

The Xtreme Air 8 model is an 8.4" [with SVGA (800 x 600) resolution] version of the Black Opal display type, specially designed for airborne use.

This is a reduced weight/reduced cost model, where some of the stringent sealing and other measures required for land and seaborne operations have been relaxed. It retains the advanced video features and generally high level of ruggedisation for which Black Opal displays are renowned.

Each Black Opal model consists of an LCD, a low reflection high clarity window, a microprocessor unit, and power & control electronics. All items are housed within a rugged enclosure containing heating and cooling mechanisms. The LCD is protected by a tough, antireflection-coated window which also provides EMI/EMC shielding. The Xtreme Air 8 window is bonded to the LCD glass with index-matched materials to minimise internal reflections, eliminating potential internal window fogging and maximising window strength. All models are button operated.

Each model features *MultiVision*, allowing for 4 video and 1 PC inputs, and providing simultaneous display of two video inputs and one PC input at full frame rates.

Images are displayed on a backlit LCD that may be viewed in full direct sunlight down to full darkness and feature backlight settings suitable for low light viewing, for viewing with Night Vision Devices and completely off for black-out conditions.

Black Opal displays have several features designed to increase the effectiveness of surveillance, sighting and security systems, including:

Image Enhancement: video inputs are compensated for obscuration (e.g. rain, fog, snow, mist or smoke) within an adjustable central window where contrast and colour are enhanced. For a chosen window size, the enhancement is applied to that portion of the displayed image;

Digital Zoom: a fully X & Y interpolated "smart" zoom, not merely pixel multiplying, yields a clear zoomed image without the blocky "pixelated" appearance often seen with digital zooming; and

Freeze Frame: freezes the current prime video channel while leaving live any video inset.

Colourisation: applies preloaded colour palettes to monochrome imagery.

Motion ("edge tearing") compensation: minimises the jagged edges that can occur with motion in video on LCDs.

These displays also provide overlay (chroma keying) capability.

Black Opal display software is easily upgradeable, upgrades can be downloaded in the field via a PC.

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2 SYSTEM SPECIFICATIONS

Notation - use of brackets in tables: [notes & qualifications] (units) {alternate units}.

2.1 System Performance

PARAMETER		SPECIFICATION
Designation		
Xtreme Air 8		Black Opal airborne special - helicopter-dedicated design, 8", high brightness, SVGA resolution
Control		
Control Functions [factory configurable to customer requirements]		On/Off; backlight intensity; menu select; select screen lay-out; select image enhancement feature; digital zoom; freeze frame
Controls		8 tactile LED-backlit buttons
Display		
Type		Amorphous Silicon Active Matrix Colour (24-bit colour) LCD Module
Display Size (² {cm})	diagonal	8.4 {21.34}
	active area	6.73 {17.09} x 5.1 {12.96}
Aspect Ratio [width:height]		4:3
Pixel Number [1 pixel is RGB trio]		800 x 600
Colour		262k [6-bit each colour]
Grey Scale		256 [8-bit]
Backlight Luminance [CCFT type; approx.; adjustable] (cdm⁻²)¹	minimum	0
	maximum	> 1,000
Contrast Ratio [limiting; LCD]		300:1
Response Time [max.] (ms)	on	20
	off	25
Readability [ambient conditions]		black-out to full direct sunlight [10 ⁵ lux]
Night Vision Device compatible?		yes [low intensity green; red also selectable]

¹ 1 cdm⁻² = 1 nit.

Product Specification



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PARAMETER		SPECIFICATION
Viewing Angle [full angle] (°)	vertical	90
	horizontal	100
Inputs		
Inputs		4 analogue video, 1 analogue RGB ("PC")
Signal Formats	video	PAL [all forms], NTSC [all forms], SECAM [all forms], CCIR-601, RS170; interlaced and non-interlaced
	PC	non-interlaced, 60Hz, RGB, separate Hsync. & Vsync. or Sync on Green, up to 800 x 600 [standard PC SVGA]
Connection Formats	video	Composite, S-Video [Y-C]
	PC	RGB + Hsync. + Vsync. or Sync on Green
Outputs		
Video		prime video input is output [what comes in goes out]
"VGA" [analogue RGB]		analogue SVGA of full screen is output [what you see is what you get]
Safety & Protection		
Cooling		thermal transfer by internal and external convection; vented
Display Window		Antireflection, hard-coated, sealed, EMI/EMC shielded; index-matched bond to LCD glass
Electrical Protection		conforms to: QSTAG 307; MIL-STD-704A; RTCA/DO-160D, Category Z, power input 18 to 30.3Vdc [min. max. & emergency operation, interrupts, abnormal surge (48Vdc for 1s), engine starting undervoltage]; RTCA/DO-160D, Category A, voltage spike [600Vdc for 10µs]
Audible Emission [@ ³ 10m]		nil
Support		
MTBF (hours)		> 8,000
Operational Life (years)		10

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2.2 Controls

Control Type	Location		Primary Label	Primary Function
Button	membrane on bottom	left	⏻	toggle between active and standby
Button	of front face	2 nd left	○	menu
Button		3 rd left		show assigned screen lay-outs for selection
Button		4 th left		enhance
Button		4 th right		zoom
Button		3 rd right		freeze
Button		2 nd right	▾	backlight down; scroll/adjust down
Button		right	▴	backlight up; scroll/adjust up

2.3 Communications

PARAMETER	SPECIFICATION	
Ports	one Serial port	
Data	Format	RS-422 [RS-232 optional]
	Rate (Baud)	19,200 [to 10 Mbaud optional; or 1,200 to 230.6kbaud for RS232]

2.4 Physical Characteristics

PARAMETER	SPECIFICATION		
Mass [approx.] (kg)	< 2.0		
Dimensions (mm)	Width	body	209
		overall ²	219
	Height	body	167
		overall ²	184
	Depth ³	body	55.4
		overall ²	68.3
Specific Gravity	> 1 [non-floatation]		

² Including mounting flange.

³ Excluding connectors.

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PARAMETER		SPECIFICATION
Mounting	Panel Mount	4 x 4.5mm diameter holes in corners
	Side Mount	4 x M4 tapped holes, 8mm deep, on each side
	Rear Mount	VESA 75 type, 4 x M4 tapped holes, 8mm deep

2.5 Electrical Characteristics

PARAMETER		SPECIFICATION
Supply Voltage (Vdc) [MIL-STD-704C]		18 to 33 [28 nominal]
Current Drain [@ 28Vdc; typical] (A)	heater on	< 3
	heater off	< 1

2.6 Environmental

PARAMETER		SPECIFICATION
Temperature (°C) Operate ⁴ [RTCA/DO-160D, class A1] Survive	min. ⁵	-15
	max. ⁶ long term	+55
	short term	+70
	min. ⁵	-40
	max. ⁶	+85
Vibration [RTCA/DO-160D, Helicopter Category R]		sine on random
Shock [; RTCA/DO-160D, Helicopter Categories B & C, drop shock]	operational	6g, 11ms; 3 shocks in each orientation
	crash safety	20g, 11ms; 3 shocks in each orientation
Sealing [RTCA/DO-160D, Category W] ⁷		water resistant [drip proof]
Altitude/Low Pressure [operational; RTCA/DO-160D, class A1]		15,000 feet
EMI/EMC ^{7,8}		MIL-STD-461D

⁴ When used in accordance with procedures in User's Manual.

⁵ Without wind-chill.

⁶ Without solar radiation.

⁷ With compliant line connectors attached.

⁸ Refer to manufacturer for details.

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2.7 Connector/Pin Details

No.	Name	Pin Marking	Purpose	Notes for Harness	Comment
A: VGA Input: Connector, MilSpec, Mil-C26482, Panel, Plug, Bayonet, 19 Way, 14 Shell, Pattern 105, square flange, AB05 2100 14-19P N00					
A1	RED OUT	A	VGA RED OUTPUT	coax (A,P), 75Ω	only for video out
A2	RED IN	B	RED INPUT	coax (B,P), 75Ω	DB15 pin 1. Also Pr input for component video
A3	GREEN OUT	C	VGA GREEN OUTPUT	coax (C,R), 75Ω	only for video out
A4	GREEN IN	D	GREEN INPUT	coax (D,R), 75Ω	DB15 pin 2. Also Y (and SOG) input for component video
A5	BLUE OUT	E	VGA BLUE OUTPUT	coax (E,S), 75Ω	only for video out
A6	BLUE IN	F	BLUE INPUT	coax (F,S), 75Ω	DB15 pin 3. Also Pb input for component video
A7	HS OUT	G	VGA HSYNC OUTPUT	signal wire	only for video out
A8	HS IN	H	HSYNC INPUT	signal wire	DB15 pin 13
A9	VS OUT	J	VGA VSYNC OUTPUT	signal wire	only for video out
A10	VS IN	K	VSYNC INPUT	signal wire	DB15 pin 14
A11	DDC_5V	L	DDC CHANNEL +5V	unused	DB15 pin 9
A12	DDC_SDA	M	DDC CHANNEL DATA	unused	DB15 pin 12
A13	DDC_SCL	N	DDC CHANNEL CLOCK	unused	DB15 pin 15
A14	RED GND	P	RED coax GND	coax braid	DB15 pin 6
A15	GREEN GND	R	GREEN coax GND	coax braid	DB15 pin 7
A16	BLUE GND	S	BLUE coax GND	coax braid	DB15 pin 8
A17	DIGITAL GND	T	HSYNC GND	signal wire	DB15 pin 5
A18	DIGITAL GND	U	VSYNC GND	signal wire	DB15 pin 10
A19	N/C	V	UNUSED	unused	DB15 pin 4,11
B: Video Input: Connector, MilSpec, Mil-C26482, Panel, Socket, Bayonet, 19 Way, 14 Shell, Pattern 105, square flange, AB05 2100 14-19S N00					
B1	Y1_GND	A	Primary video (composite or luma) GND	coax, 75Ω shield	
B2	Y1_SIGNAL	B	Primary video (composite or luma) input	coax, 75Ω center	75Ω terminated in display

Product Specification

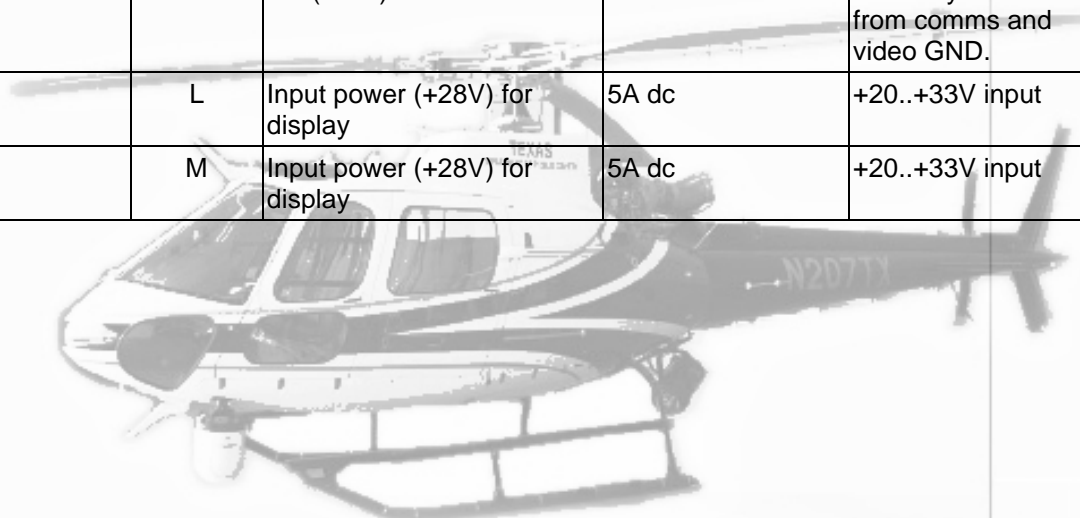


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No.	Name	Pin Marking	Purpose	Notes for Harness	Comment
B: Video Input (cont'd)					
B3	Y2_GND	C	Secondary video (composite or Y) GND	coax, 75Ω shield	
B4	Y2_SIGNAL	D	Secondary video (composite or Y) input	coax, 75Ω center	75Ω terminated in display
B5	RS485+	E	RS485+ connection	signal	
B6	RS485-	F	RS485- connection	signal	
B7	V-	G	dc- (GND) connection	5A dc	internally isolated from comms and video GND.
B8	V+	H	Output power (+28V)	5A dc	Same as input dc
B9	V+	J	Output power (+28V)	5A dc	Same as input dc
B10	VIDEO_OUT	K	Switched video output	coax, 75Ω center	either Y1 or Y2 output, 75Ω double terminated
B11	GND_OUT	L	Video output GND	coax, 75Ω shield	
B12	SPARE1	M	Analogue input	signal	SPARE1
B13	SPARE2	N	Analogue input	signal	SPARE2
B14	C1_SIGNAL	P	Primary chroma input [or VCR composite input]	coax, 75Ω center	75Ω terminated in display
B15	C2_SIGNAL	R	Secondary chroma input	coax, 75Ω center	75Ω terminated in display
B16	C_GND	S	Chroma common [or VCR composite input]	coax, 75Ω shield	
B17	V-	T	dc- (GND) connection	5A dc	internally isolated from comms and video GND.
B18	RS-232_TX	U	RS-232 transmit (output from display)	signal	
B19	RS-232_RX	V	RS-232 receive (input to display)	signal	
C: dc Power Input & Comms Port Connection: Connector, MilSpec, Mil-C26482, Panel, Plug, Bayonet, 12 Way, 14 Shell, Pattern 105, square flange, AB05 2100 14-12P N00					
C1	COMMS_GND	A	common for comms	signal	
C2	N/C	B	unused		

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No.	Name	Pin Marking	Purpose	Notes for Harness	Comment
C: dc Power Input & Comms Port Connection (cont'd)					
C3	RS-232_RX	C	RS-232 receive (input to display)	signal	
C4	RS-232_TX	D	RS-232 transmit (output from display)	signal	
C5	nRESET	E	active low display reset control	reserved	
C6	MODAB	F	active low display bootload control	reserved	
C7	RS485-	G	RS485- connection	reserved	
C8	RS485+	H	RS485+ connection	reserved	
C9	V-	J	dc- (GND) connection	5A dc	internally isolated from comms and video GND.
C10	V-	K	dc- (GND) connection	5A dc	internally isolated from comms and video GND.
C11	V+	L	Input power (+28V) for display	5A dc	+20..+33V input
C12	V+	M	Input power (+28V) for display	5A dc	+20..+33V input



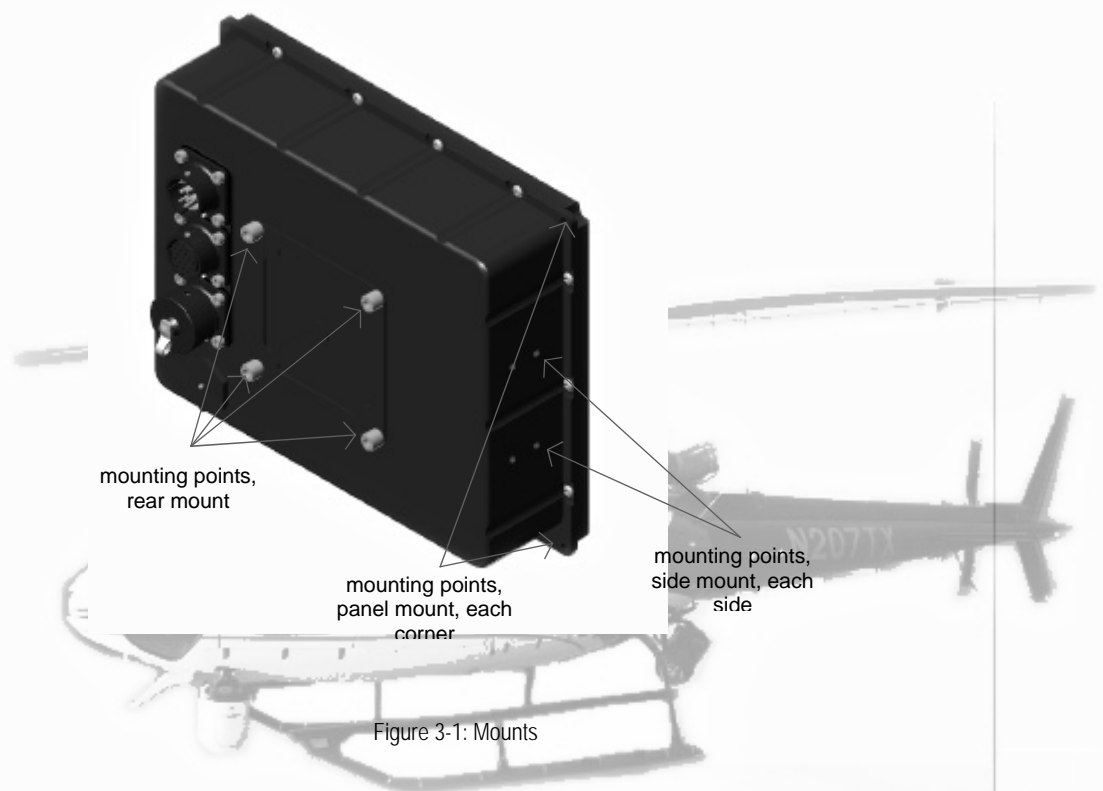
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3 SET-UP

3.1 Mounts

The unit has three mounting methods:

1. Panel Mount: one 4.5mm diameter hole in each corner of the front bezel.
2. Side Mount: four M4 tapped holes, 8mm deep, on each side of the rear section.
3. Rear Mount: VESA 75 type, four M4 tapped holes, 8mm deep, on the rear face of the unit.



3.2 Connections

The unit has three connection points located on the rear:

Connector A, the VGA Input connector (V-sync and H-sync analogue RGB inputs);

Connector B, the Video Input connector (analogue video and sync-on-green analogue RGB inputs); and

Connector C, the dc Power Input & Comms Port connector.

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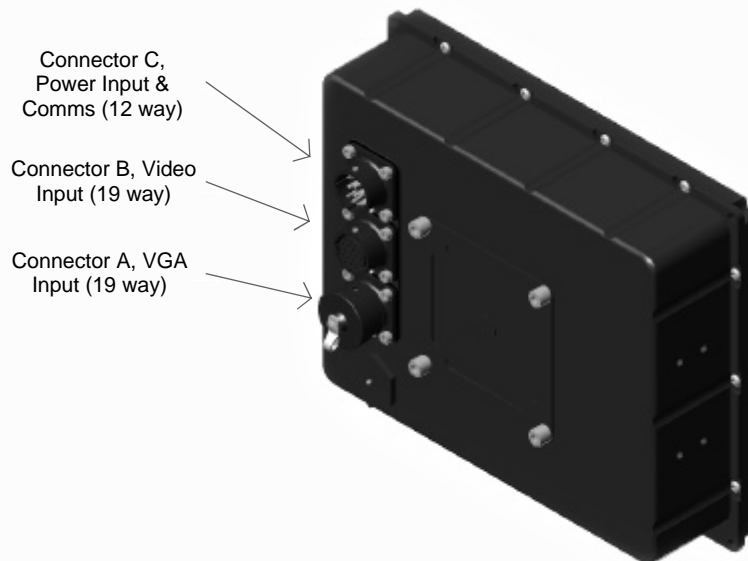


Figure 3-2: Connections

3.3 Set-up Procedure

CAUTION: User-supplied cables must be correctly wired (see list of Connector/Pin Details).

Ensure that external power is within the range specified herein.

Ensure that external power is OFF before proceeding with set-up.

- Mount the unit to the vehicle or platform, using the four Dzus fasteners provided.
- Connect the required video cable and/or sync-on-green analogue VGA cable to Connector B and to the external imaging system(s).
- Connect the required VGA cable to Connector A and to the external VGA source.
- Connect the required power/data cable to Connector C and to the external power source, and to the communication data source (RS-232).

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3.4 Heating and Cooling

The unit contains internal heating and cooling mechanisms that are triggered at certain internal temperatures.

The approximate warm-up rate is 17s/°C (e.g. with starting internal temperature of -40°C, unit will power up in about 11 minutes; with starting internal temperature of -25°C, unit will power up in about 7 minutes).

Once the unit has warmed it will operate normally provided that the ambient temperature stays within the specified operating temperature range.

The operating procedures, internal temperatures and resulting operating conditions are shown in the following table.

Ambient Temp. (°C)	Procedure	Internal Temp. (°C)	Operating Condition
< -40	do not attempt to operate unit		
-40 to 0	de-ice unit prior to start-up	≤ 0	unit will not power up; heater on
		> 0	unit will power up; internal convection on
0 to +55	none	≥ 10	heater off
		≥ 55	backlight reduces
+55 to +70	provide forced air cooling (e.g. fan)		
> +70	do not attempt to operate unit	≥ 75	unit will not power up

